

REMARKS/ARGUMENTS

As a result of this Amendment, claims 1-6, and 10 are under active consideration in the subject patent application.

In the Non-Final Official Action, the Examiner:

(1) acknowledged election of claims 1-6 and 10 for prosecution within this application;

(2) noted that Claim 10 is a hybrid product by process claim for reciting -- "being formable by any of the preceding method"--;

(3) rejected claim 4 as being indefinite under 35 U.S.C. §112, second paragraph; and

(4) rejected claims 1-6 and 10 as being anticipated by Japanese Patent No. JP406349940 issued to Watanabe et al. (the Watanabe reference).

With regard to Item 1, no further comment appears necessary.

With regard to Item 2, claim 10 has been amended to remove reference to "preceding methods," and therefore is no longer being presented in "product by process form.

With regard to Item 3, claim 4 has been amended to remove the limitation "and is substantially zero." Claim 4 is definite. Reconsideration is requested.

With regard to Item 4, independent claims 1 and 10 have been amended to include the limitation that the under-etched regions have a width and a depth that correspond to approximately half of the thickness of the buried insulating layer. This feature of the invention is disclosed in the written description in the context of Figure 3. No new matter has been added.

As defined by amended claim 1, a method of forming an isolation trench is provided by which the dielectric strength may be enhanced at the critical bottom area without modifying the top area of the trench. A two-step process is performed such that, in the second isotropic etch step, the under-etched regions are formed so as to have a width and a depth that correspond to approximately half of the thickness of the buried insulating layer. By controlling the second etch step in this manner the remaining thickness of the buried insulating layer provides sufficient dielectric strength with respect to the substrate, while there is provided a desired sufficiently large area for enabling an oxygen flow so as to obtain an increased oxidation rate locally at the under-etched region. The increased oxidation rate thus results in a desired pronounced edge rounding at the bottom of the isolation trench, without increasing the thickness of the insulating layer at the sidewalls of the trench beyond a target thickness. In this manner, well-established design concepts may be applied for forming the isolation trench, while at the same time achieving superior dielectric characteristics at the trench bottom edges.

Anticipation under 35 U.S.C. §102 requires that each and every element of the invention defined in the claim be met in a single prior art reference. Those elements must either be inherent or disclosed expressly, and must be arranged as described in the claim. See, Diversitech Corporation v. Century Steps, Inc., 850 F.2d 675, 7 U.S.P.Q.2d 1315 (Fed. Circuit 1988), Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 7 U.S.P.Q.2d 1057 (Fed. Circuit 1988), and Richardson v. Suzuki Motor Company, 868 F.2d 1226, 9 U.S.P.Q.2d 913 (Fed. Circuit 1989). The inventions of

amended claims 1 and 10 are not found within the four corners of the Watanabe reference.

Watanabe generally relates to a technique for reducing the mechanical stress at the bottom of isolation trenches. However, Watanabe does not provide any teaching in view of increasing the dielectric strength of the isolation trenches, nor does it even hint at the problem of increased field strength at the trench bottom. Although an isotropic etch process is referred to in order to form undercut parts in the trenches, a control of this process so as to obtain the shape of under-etched regions, as in the present invention, is neither disclosed nor suggested by Watanabe..

Instead, Watanabe suggests that upon providing for a "desired" increased thickness of the insulating layer formed on the sidewalls of the trenches, a high risk exists that the underlying substrate material may be oxidized (see para [0031]). Hence, according to Watanabe, the thickness of the insulating layer at the trench sidewalls has to be reduced, and/or at least the width of the undercut parts should be controlled so as to be significantly less than half of the thickness of the buried insulating layer, (Figs 15 to 17) otherwise oxidation of the substrate may lead to additional distortions. In view of this problem, Watanabe proposes to provide an additional silicon nitride etch stop layer below the buried silicon dioxide layer in order to avoid any disadvantageous oxidation of the substrate material.

Consequently, when being confronted with the task of improving the dielectric strength of isolation trenches in SOI devices receiving regions of very different operating voltages, Watanabe fails to teach or in any way suggest the solution of amended claims 1 and 10. Watanabe is not aware of this problem. Furthermore, if one were to adopt the

technique described by Watanabe, which is clearly not motivated, additional re-designs of the device would be required, for instance for incorporating the silicon nitride material or by taking into account a reduced thickness of the insulating layer on the trench sidewalls, thereby increasing complexity of the overall process flow and the device configuration.

For at least the foregoing reasons, amended independent claims 1 and 10 are patentable over the disclosure of the Watanabe reference. Accordingly, dependent claims 2-6 are also patentable at least through dependency. Reconsideration and withdrawal of the rejections under 35 U.S.C. §102 in view of the Watanabe reference is requested.

In view of the foregoing, Applicant respectfully submit that claims 1-6, and 10 are in condition for allowance. Favorable reconsideration is therefore respectfully requested. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

If a telephone conference would be of assistance in advancing prosecution of the above-identified application, Applicant's undersigned Attorney invites the Examiner to telephone him at 215-979-1255.

Date: October 28, 2010

Respectfully Submitted,
/Samuel W. Apicelli/
Samuel W. Apicelli
Registration No. 36,427
Customer No. 08933
DUANE MORRIS LLP
30 South 17th Street
Philadelphia, PA 19103-4196
Tel: (215) 979-1255
Fax: (215) 979-1020
swapicelli@duanemorris.com